A Really Speedy Overview of the Mathematics and Computer Science Division at Argonne National Laboratory

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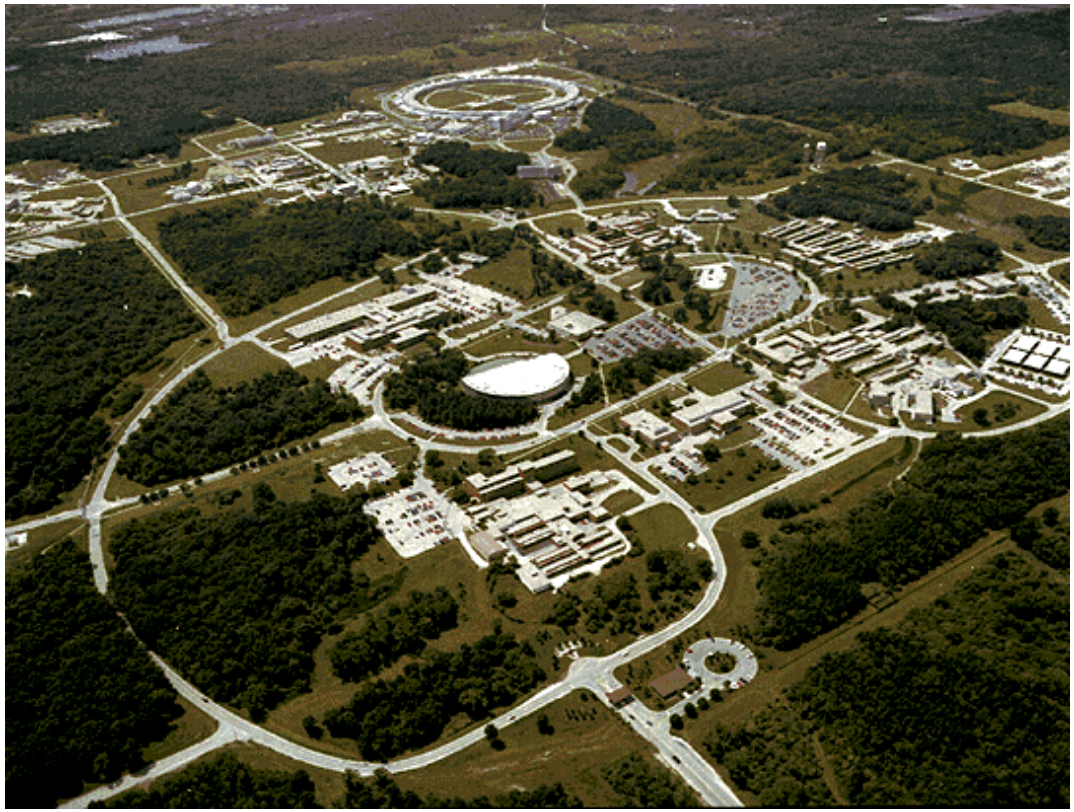
Argonne National Laboratory



- www.anl.gov
- About 30 minutes southwest of Chicago.
- 5000 employees
- Focus areas:
  - Many different kinds of science and scientific facilities - physics, mathematics, biosciences, etc.
  - The Advanced Photon Source.
  - Energy Sciences and research.

Argonne is one of 15 National Laboratories that are run by the Department of Energy. Argonne is operated for the DOE by the University of Chicago.

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Argonne Divisions

- **Advanced Photon Source**
- **Analytical Chemistry Laboratory**
- **Biosciences**
- Central Shops
- **Chemical Technology**
- **Chemistry**
- Decision and Information Sciences
- Division of Educational Programs
- Electronics and Computing Technologies
- **Energy Systems**
- **Energy Technology**
- Environment, Safety, and Health
- Environmental, Safety & Health Quality Assurance Oversight (ESH/QA)
- Environmental Assessment
- Environmental Programs
- **Environmental Research**
- **High Energy Physics**
- Human Resources
- Information and Publishing Division
- Infrastructure Assurance Center
- **Intense Pulsed Neutron Source**
- International Nuclear Safety Center
- Legal Department
- **Materials Science**
- **Mathematics and Computer Science**
- Medical Department
- Office of the Chief Financial Officer
- Office of Public Affairs
- Office of Technology Transfer
- **Physics**
- Plant Facilities and Services
- Procurement Department
- **Reactor Analysis**
- **Reactor Engineering**
- **Structural Biology Center**
- Travel Services
- Technology Development
- Transportation Technology R&D Center

People in MCS

- Scientists
  - Computer scientists
  - Mathematicians
  - Computational scientists
- Postdocs
- Research Assistants
- Programmers
- System and Network Engineers
- Students
- Administrative Staff

- … around 75 people
  - 100-150 in the summer.

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MCS Activities

- 5 distinct groups within the division
  - Laboratory for Advanced Numerical Software
    - Math, Logic programming, Numerical software, Computational Science, Systems software, ...
  - Distributed Systems Laboratory
    - Distributed operating system research (“grid” stuff)
  - Futures Lab
    - Virtual Reality, Graphics, Collaboration Systems, Large Displays, ...
  - The Systems Group
    - Systems administration, network engineering, development, some systems research
  - Administrative Staff

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MCS Funding - The Ongoing Battle

- Only about 15% of MCS funding is “stable”.
  - The rest is acquired through competition for research grants that usually last 1-2 years.
    - Most of these are peer-reviewed projects.
  - Sources for funding:
    - Various DOE research programs
    - NSF large-scale grants and collaborations
    - NASA, NIH, DARPA, etc
    - State funding for some projects.
    - Corporate partnerships - IBM, Microsoft, Nalco, ..
  - The Argonne overhead rate is about 30%.
- < Insert rant about funding long-term science here.>

MCS Computing Environment

High-End Systems	Servers	Personal Machines
Storage Systems	Networks	Viz Systems
Clusters	Laboratory Systems	

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MCS Computing Environment

High-End Systems

Chiba City: 256 node Linux cluster
Quad: 80 node IBM SP-2
(TeraGrid IA-64 Cluster)
(Chiba II)
(ANL Production Cluster)

Servers

UNIX servers: approx 50
Fileservice (4TB), DNS, Mud
Mail (30,000 messages/day),
Web (15 servers), FTP, ….
10 NT/Windows 2000 servers.

Personal Machines

200 or so desktops (varies with the weather). Linux, Windows, Solaris, IRIX.
150 or so laptops.

Storage Systems

ADSM: 60TB backup systems
HPSS: experimental storage

Networks

LAN: 1000/100/10 switched ethernet.
WAN: OC-12.
ANL Border routers.
Massive external network activity.

Viz Systems

Tundra: 32 node SGI Origin 2000
Additional Access Grid Nodes

Clusters

18 node Alpha/Servernet II
8 node Windows NT MPICH
22 node DSL DataGrid node
16 node FL viz cluster
Other clusters come and go as needed… around 10 at present.

Lab Systems

The CAVE.
The Active Mural.
Access Grid Systems.
A few dozen desktops and dedicated lab machines and clusters not part of the primary MCS environment.
QoS Network testbeds.

Around 1600 total computers.

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High Performance Computing at MCS

The ACRF: 1985-1993

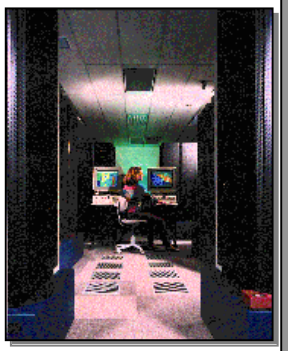
Systems: CM-2, Encore, Sequent, BBN Butterfly, Intel Gamma, ...

Mission:
Computer Science & Outreach

The IBM SP-1: 1993-1997

System: 128 Nodes
The First IBM SP installed.
(Simultaneous with Cornell.)

Mission:
Grand Challenge Apps
Work with IBM



The IBM SP-2: 1996-present

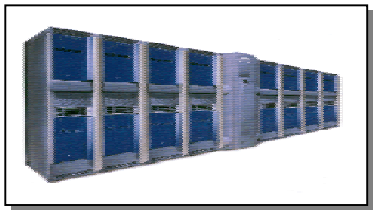
System: 80 Nodes
Upgrade of SP-1

Mission:
Grand Challenge Applications

The SGI Origin 2000: 1998 - present

System: 128 CPUS
12 IR Pipes

Missions:
Visualization Research
SMP Testbed for CS
Grand Challenge Apps



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Chiba City - the Argonne Scalable Cluster

256 computing nodes.
512 PIII CPUs.

32 visualization nodes.

8 storage nodes.
4TB of disk.

Myrinet interconnect.

Mission: Scalability and open source software testbed.

1 of 2 rows of Chiba City:

http://www.mcs.anl.gov/chiba/

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Student Opportunities

- MCS hires students as research assistants, usually as a part of a college or graduate program.

- Details on our web site:
  - www.mcs.anl.gov
  - www.mcs.anl.gov/edu_prog/studentopps.html

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